

CLAIMS

What is claimed:

1. A method of processing an electronic assembly, comprising:
capturing an image of a contact formation on a surface of a semiconductor package, the semiconductor package including a microelectronic die with an integrated circuit formed therein, the image having a width and a captured contact point corresponding to an actual contact point on the contact formation and comprising a plurality of pixels, the pixels having side lengths of at least 20 percent of the width of the image; and
placing the semiconductor package on a circuit board having a socket such that the actual contact point is in a selected position relative to the socket.
2. The method of claim 1, further comprising picking the semiconductor package from a support.
3. The method of claim 2, further comprising suspending the surface of the semiconductor package within a field of view of the camera.
4. The method of claim 3, wherein the image is captured with a CCD camera.

5. The method of claim 4, wherein the contact formation has a surface comprising a first area and a second area.
6. The method of claim 5, where in the first area is a normal brightness area and the second area is a dull brightness area.
7. The method of claim 6, wherein the captured image includes only the normal brightness area of the outer surface of the contact formation.
8. The method of claim 7, wherein the contact formation has an outer edge and an actual center.
9. The method of claim 8, further comprising defining an outer edge of the captured image and determining a captured image center.
10. The method of claim 9, wherein the captured image center corresponds to the actual center of the contact formation.
11. The method of claim 10, wherein the contact formation is substantially spherical.
12. The method of claim 11, wherein there are a plurality of contact formations on the surface of the semiconductor package.

13. The method of claim 12, wherein the contact formations are BGA solder balls.
14. The method of claim 13, wherein the contact formation has a diameter of approximately 0.55 mm.
15. The method of claim 14, wherein the semiconductor package is a microprocessor.
16. The method of claim 15, wherein the circuit board is a motherboard.
17. The method of claim 16, wherein the socket has a plurality of conductor pads formed therein and when the semiconductor package is placed within the socket, the actual contact point of each contact formation contacts a conductor pad in the socket.
18. A method of processing an electronic assembly, comprising:
 - capturing an image of a contact formation on a surface of a semiconductor package with a CCD camera, the semiconductor package including a microelectronic die with an integrated circuit formed therein, the contact formation having a surface with an actual contact point, the image having an captured contact point corresponding to the actual contact point on the outer surface; and

placing the semiconductor package on a circuit board having a socket such that the actual contact point is in a selected position relative to the socket.

19. The method of claim 18, wherein the actual contact point is an actual center of the contact formation and the captured contact point is a captured center of the image.

20. The method of claim 19, wherein the semiconductor package is a microprocessor and the circuit board is a motherboard.

21. A method of processing a semiconductor package, comprising:
picking a microprocessor from a support, the microprocessor having a bottom surface with a plurality of contact formations formed thereon and including a microelectronic die with an integrated circuit formed therein, the contact formations being substantially spherical, each having a surface and being electrically connected to the integrated circuit, the surface having an actual center, a normal brightness area, and a dull brightness area;
suspending the bottom surface of the microprocessor within a field of view of a CCD camera;
capturing an image of the normal brightness area of at least one of the contact formations with the CCD camera, the image having a width and a captured center and comprising a plurality of pixels, the captured center

corresponding to the actual center, the pixels being square with sides of at least 20 percent of the width of the image; and

placing the microprocessor in a socket on a motherboard, the socket with a plurality of conductor pads formed therein, so that the actual center of each contact formation contacts a conductor pad within the socket and the integrated circuit is electrically connected to the conductor pads.

22. The method of claim 21, wherein the support is a reel with an adhesive tape attached thereto.

23. The method of claim 22, wherein the contact formations are BGA solder balls.

24. An apparatus for processing electronic assemblies, comprising:

a frame;

a semiconductor package support secured to the frame to support a semiconductor package, the semiconductor package having a surface with a contact formation thereon and including a microelectronic die with an integrated circuit formed therein;

a CCD camera, having a field of view, connected to the frame to capture an image of the contact formation;

a printed circuit board support secured to the frame to support a printed circuit board, the printed circuit board having a socket; and

a pick-and-place head connected to the frame for movement to pick the semiconductor package from the semiconductor package support, suspend the semiconductor package so that the surface of the semiconductor package is in the field of view of the CCD camera, and place the semiconductor package in the socket on the printed circuit board.

25. The apparatus of claim 24, wherein the CCD camera has a focal length and the pick-and-place head is connected to the frame such that it suspends the semiconductor package in the field of view of the CCD camera so that the surface of the semiconductor package is at the focal length of the CCD camera.
26. The apparatus of claim 25, wherein the support comprises an adhesive tape attached to a reel.
27. The apparatus of claim 26, wherein the circuit board is a motherboard.
28. The apparatus of claim 27, further comprising a computer in communication with communication with and coordinating the actions of the CCD camera and the pick-and-place head.